CONNECTOR FOR A RIBBON CABLE

FIELD OF THE INVENTION

The invention relates to a contact arrangement for a ribbon cable and, more particularly, to a connector for a ribbon cable.

BACKGROUND OF THE INVENTION

Ribbon cables are used in a wide range of technical fields, such as, motor vehicle engineering, because they are flexible and enable a plurality of wires to be installed in tight spaces. The ribbon cables are secured in connectors and are electrically connected to contact elements. Although conventional connectors used for this purpose are simple to manufacture, these conventional connectors are often formed such that access to the ribbon cable for contact by the contact elements is limited. Additionally, these conventional connectors afford very little support for the ribbon cable.

SUMMARY OF THE INVENTION

It is, therefore, an object of the invention to provide a connector for a ribbon cable where the ribbon cable is well supported and easily accessible.

This and other objects are achieved by a connector for a ribbon cable comprising a housing having a ribbon cable receiving region extending between a front surface and a back surface of the housing. Retention clips are arranged on the back surface of the housing and extend into the ribbon cable receiving region. The retention clips are arranged at a fixed spacing such that the ribbon cable receiving region is accessible between each of the retention clips for receiving contact elements.

This and other objects are further achieved by a connector comprising a housing having a ribbon cable receiving region extending between a front surface and a back surface of the housing. A ribbon cable disposed in the ribbon cable receiving region. The ribbon cable has contact sections arranged at the back surface of the housing. Retention clips arranged on the back surface of the housing that receive a portion of the ribbon cable. The retention clips are arranged at a fixed spacing such that the contact sections of the ribbon cable are accessible between each of the retention clips for receiving contact elements.

This and other objects are still further achieved by a connector arrangement comprising a contact socket having first and second contact elements. A connector has a ribbon cable

receiving region extending between a front surface and a back surface of the housing. A ribbon cable disposed in the ribbon cable receiving region. The ribbon cable has contact sections formed on top and bottom surfaces thereof. Retention clips formed on the back surface of the housing receive a portion of the ribbon cable. The retention clips are arranged at a fixed spacing such that the contact sections are accessible between each of the retention clips by the first and second contact elements.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded view of a contact arrangement showing a ribbon cable, connector, contact socket, and contact element;

Fig. 2 is an exploded view of a bottom side of the contact arrangement of Fig. 1;

Fig. 3 is a cross-sectional view of the connector of Fig. 2;

Fig. 4 is a partial perspective view of a support arm of the connector;

Fig. 5 is a cross-sectional view of the contact arrangement in an assembled state; and

Fig. 6 is a plan view of a top side of the contact arrangement of Fig. 5.

DETAILED DESCRIPTION OF THE INVENTION

Figs. 1 and 2 show a contact arrangement including a ribbon cable 1, a connector 4, a contact socket 6, and a contact element 5. Figs. 1 and 2 show the individual parts of the contact arrangement before assembly and before insertion of the connector 4 into the contact socket 6.

As shown in Fig. 1, the ribbon cable 1 includes a plurality of conductor wires 2 arranged in parallel. The conductor wires 2 are surrounded by an insulation layer 3 and are illustrated diagrammatically by dashed lines inside the insulation layer 3. As shown in Figs. 1 and 2, contact windows 7 are provided on top and bottom surfaces of the ribbon cable 1 and adjacent to the conductor wires 2. The insulation layer 3 is stripped-off of the conductor wires 2 in a region adjacent to the contact windows 7 to form an exposed contact section 30. Alternatively, if insulation displacement contact elements (not shown), which penetrate the insulation layer 3 to establish contact with the conductor wires 2, are used in the contact arrangement, the ribbon cable 1 may be

formed without the contact windows 7 and the insulation layer 3 does not have to be stripped-off of the conductor wires 2.

As shown in Fig. 1, the contact socket 6 has a substantially rectangular insertion aperture 14 for receiving the connector 4. The insertion aperture 14 has a cross-section that substantially corresponds to a cross-section of the connector 4 so that the connector 4 is guided by inner surfaces of the contact socket 6 when inserted therein. Retention recesses 16 are formed on opposing side walls 15 of the contact socket 6 near the insertion aperture 14. Opposite the insertion aperture 14, a rear surface of the contact socket 6 has an opening for receiving the contact element 5.

As shown in Fig. 1, the contact element 5 includes a contact plate 17. The contact plate 17 has connecting pins 18 molded on a back surface of the contact plate 17 and first and second contact elements 19, 20, respectively, molded on a front surface of the contact plate 17 opposite to the connecting pins 18. Each of the first contact elements 19 has a convex contact region 23. As best shown in Fig. 5, each of the second contact elements 20 branches into third and fourth contact elements 21, 22, respectively. The third and fourth contact elements 21, 22 are arranged in a common plane with the first contact element 19. The third and fourth contact

elements 21, 22 are arranged to form a substantially oval shape and have ends that extend beyond the convex contact region 23 of the first contact element 19. The third contact element 21 has a convex contact region 31 arched towards the convex contact region 23 of the first contact element 19. The convex contact region 31 of the third contact element 21 is arranged at a fixed distance above the convex contact region 23 of the first contact element 19.

As shown in Figs. 1 and 5, the connector 4 consists of a housing 10 having an insertion slot 8 on a rear surface thereof for insertion of the ribbon cable 1. Adjacent to the insertion slot 8 is a ribbon cable receiving region 26 that extends to a front surface or contact side of the connector 4. Retention holes 9 are formed on an upper surface 34 of the housing 10. Support elements 11 extend along longitudinal side walls 32 of the housing 10. The support elements 11 are formed from a flexible material, such as plastic, and have a first end molded onto the housing 10 on the contact side of the connector 4. Each of the support elements 11 is preferably identical in shape. As best shown in Fig. 4, each of the support elements 11 is arranged at a fixed angle relative to the longitudinal side walls 32 of the housing 10. The support elements 11 extend to the rear surface of the

connector 4 and have a lever 12 on an exterior side thereof that extends outwards. A cam 13 is provided on the exterior side of each of the support elements 11 near the lever 12. The cams 13 are formed to correspond with the retention recesses 16 on the contact socket 6 so that the support elements 11 positively secure the connector 4 to the contact socket 6 when the connector 4 is received therein. As shown in Fig. 3, the housing 10 has an actuation surface 27 preferably arranged at a sloping angle toward an insertion direction of the connector 4.

As shown in Fig. 2, a lower surface 24 of the housing 10 has secondary retention holes 28 opposite the retention holes 9. The lower surface 24 merges on the contact side of the housing 10 into the retention clips 25 that may be molded with the housing 10. Each of the retention clips 25 have the same width and are arranged between the longitudinal side walls 32 of the housing 10 at a fixed spacing from one another and within the receiving region 26. The retention clips 25 are preferably formed such that the retention clips 25 do not extend beyond the longitudinal side walls 32 of the housing 10 so that the retention clips 25 are protected from being damaged. The retention clips 25 are arranged at a fixed distance from the upper surface 34 of the housing 10 so that

the spaces between the retention clips 25 are easily accessible by the first and third contact elements 19, 21 from the upper and lower surfaces 34, 24 of the housing 10.

As shown in Fig. 5, each of the retention clips 25 is substantially u-shaped and has a first side 36 that forms a contact surface for the ribbon cable 1 and a second side 35 that is longer than the first side 36 that forms a bearing and retention surface for the ribbon cable 1. As shown in Fig. 3, the second sides 35 of the retention clips 25 and an exposed part of the receiving region 26 are freely accessible for contact with the first contact element 19 from the lower surface 24 of the housing 10, and the first sides 36 of the retention clips 25 are arranged at a fixed distance below the actuation surface 27 of the housing 10 so that an exposed part of the receiving region 26 and the first sides 36 are freely accessible for contact with the third contact element 21 from the upper surface 34 of the housing 10.

As shown in Fig. 5, the connector 4 has retaining pins 29. The retaining pins 29 are formed to extend from the retention holes 9 to the secondary retention holes 28. The retaining pins 29 may be made, for example, from plastic.

Assembly of the contact arrangement will now be described in greater detail. As shown in Fig. 3, the ribbon cable 1 is

inserted into the insertion slot 8, receiving region 26, and retention clips 25 of the connector 4 until the edge of the ribbon cable 1 is received between the first sides 36 and second sides 35 of the retention clips 25. As shown in Fig. 5, the ribbon cable 8 is secured in the connector 4 by the retention pins 29, which are inserted into the retention holes 9, through the ribbon cable 1 into spaces between the conductor wires 2, and through the secondary retention holes 28. The retention pins 29 are connected to the housing 10 of the connector 4 and may be crimped, soldered, or glued thereto. The ribbon cable 1 is thereby fixed parallel and perpendicular to the direction of insertion.

As shown in Fig. 5, the contact element 5 is arranged in the contact socket 6 and is positioned to electrically contact the conductor wires 2 of the ribbon cable 1 when the contact arrangement is assembled. The contact element 5 is inserted into a side of the contact socket 6 opposite the insertion aperture 14 until the contact elements 19, 21, 22 are arranged between the retention clips 25. The connector 4 is inserted into the insertion aperture 14 of the contact socket 6 until the exposed contact sections 30 of the conductor wires 2 are arranged between the convex contact regions 23, 31 of the first and third contact elements 19, 21. The first contact

element 19 is arranged beneath the ribbon cable 1, and the third and fourth contact elements 21, 22 are arranged above the ribbon cable 1. As a result, relatively large contact elements 19, 21 can be used to contact the conductor wire 1, and the retention clips 25 can aid in aligning the contact elements 19, 21 with the conductor wires 2 of the ribbon cable 1.

As the connector 4 is inserted into the contact socket 6, the fourth contact element 22 is biased via the actuation surface 27 towards the ribbon cable 1. Because the actuation surface 27 is arranged at a sloping angle towards the insertion direction of the connector 4, the distance between the actuation surface 27 and the ribbon cable 1 decreases towards a center of the connector 4. The fourth contact element 22, therefore, is pressed towards the ribbon cable 1 when the connector 4 is inserted into the contact socket 6. Since the fourth contact element 22 is connected to the third contact element 21, the third contact element 21 is also pressed toward the ribbon cable 1 and into contact therewith. As a result, pressure is exerted onto the exposed contact sections 30 of the conductor wires 2 by the convex contact region 31 of the third contact element 21 from above and the convex contact region 23 of the first contact element 19 from

below when the connector 4 is inserted. In this way the conductor wire 2 of the ribbon cable 1 can be contacted on both sides, and a high contact force can be achieved without damaging the conductor wires 2.

Alternatively, a flat actuation surface may be used to bias the first, third, and fourth contact elements 19, 21, 22. In this instance, the fourth contact element 22 is constructed to extend upwards from a free end thereof, so that the flat actuation surface forces the third contact element 21 further toward the ribbon cable 1 with increasing insertion depth of the connector 4.

As shown in Fig. 6, as the connector 4 is received in the contact socket 6, the cams 13 are received in the retention holes 16 and the support elements 11 are tightened by the longitudinal side walls 32 of the housing 10 towards the side walls 15 of the connector 4. To remove the connector 4 from the contact socket 6, the support elements 11 are pressed inward by the levers 12, and the cams 13 are led inward and out of the retention holes 16 so that the connector 4 may be removed from the contact socket 6.